MODIS Quarterly Report, March 1997
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This reports covers the **aerosol ocean** and **aerosol land** algorithm, and our involvement in the **NIR water vapor** algorithm and **fire algorithm**.

Main topics addressed in this period:

1. Evaluated MODIS cloud mask and developed custom interpretation of aerosol algorithms (*Ji, Remer*).
2. Finished developing joint Atmospheric Group Version 2 file specifications for both L2 and L3, all products *(Chu, Mattoo).*
3. Analysis of TARFOX field experiment data: intercomparisons of various instruments; interannual variations by comparison with SCAR-A data; industrial/smoke variations by comparison with SCAR-B data; testing of MODIS aerosol retrieval algorithm using MAS imagery (*Remer, Ji, Tanré, Li, Mattoo*).
4. Analysis of the SCAR field experiment data: fire analysis software run and fire statistics compiled; individual fires analyzed; AVIRIS targets analyzed for w_o; *(Kaufman, Kleidman, Li,)*
5. Analysis of data from laboratory experiment, in the Forest Service Fire Lab. with an CIA/John Hopkins Univ. instrument. *(Kaufman, Wald, Korb).*
6. Development of a new technique for remote sensing of dust over land using IR channels, to supplement present algorithm for remote sensing of aerosol from MODIS *(Wald ,Tanre, Kaufman)*
7. Surface properties in the mid-IR and the visible: March data collected over Charles County; analysis of CAR data, planning for experiment in Israel*(Kaufman, Wald, Remer, Ji., Kleidman*)
8. Continued archiving and processing of TARFOX and SCAR-B MAS imagery for use as MODIS algorithm testbed. Continued validation of all algorithms *(Kaufman, Li, Chu, Mattoo)*
9. Finished look-up tables for smoke aerosol. (*Chu*)
10. Submitted MODIS atmosphere QA plan to EOS project office. (*Chu*)
11. Study of vegetation indices. Analysis of AVIRIS images over Cuiaba and Alta Floresta. Comparison of NDVI, ARVI, AFRI and GARI in both clear and smoky conditions. Scatter plots and color images (*Kaufman, Li*)
12. Urban/Industrial aerosol paper submitted to JGR. *(Remer,Kaufman)*

Topics postponed (or continued) to next quarter

1. Look-up table generation for aerosol over land urban/industrial aerosol, dust*(Chu)*.
2. Look-up table generation for aerosol over ocean *(Ahmad, Mattoo).*

Plans for the next quarter:

1. Analysis of the SCAR-B MAS data for fires, smoke, surface properties, clouds and total precipitable water *(Chu, Kleidman, Li, Remer).*
2. Continued analysis of the fire lab data (Wald)
3. Smoke aerosol model (Remer)
4. Dust aerosol model (Tanre, Fraser)
5. Israel field experiment (Kaufman, Wald, Kleidman, Remer)
6. Aerosol validation paper using SCAR measurements *(Chu).*
7. Getting AVHRR LAC data for smoke-cloud interaction analysis

1. Evaluation of MODIS cloud mask

It is important that we choose the cloud mask tests that screen clouds without eliminating scenes of high aerosol optical thickness. Working with Steve Ackerman and reviewing MAS and AVHRR imagery in different aerosol regimes we developed a custom interpretation of the MODIS cloud mask tests that basically ignores the straight visible threshold test, but does use the visible ratio tests and various IR tests. The cloud shadow test appears to work very well.

2. Version 2 File Specifications

The version 2 file specifications of level 2 and level 3 aerosol and total precipitable water have been reconfigured to accommodate the joint product of aerosol over land and ocean, and total precipitable water of near IR and IR. The new configuration of each product includes geolocation, solar and satellite angles as a self-content data file.

3. TARFOX data

Analysis of TARFOX data proceeds in different directions: 1) AERONET size distributions are being compared with airborne measurements by the UKMO aboard the C130 2) Ground-based microphysical measurements were compared with similar measurements made in Brazil during SCAR-B. 3) The AERONET network data is being compared to the SCAR-A data base. In general we find that TARFOX was generally less hazy and more regionally uniform than SCAR-A. However, the important characteristic of a dynamic accumulation mode increasing in particle size with increasing optical thickness dominates the TARFOX data set; thereby, supporting the use of the dynamic model in the MODIS land aerosol algorithm. 4) MAS imagery has been used to test MODIS retrieval algorithms both over land and sea. The ocean retrieval has shown generally favorable results when compared to in situ measurements.

4. Analysis of the SCAR field experiment data

1) The MAS automatic fire analysis software was completed. The algorithm detects fires and determines fire and background statistics. The algorithm will be applied to the entire MAS data base. 2) Individual fire targets were carefully selected and analyzed to determine smoke production as function of fire thermal energy. 3) AVIRIS targets analyzed for w_o

5. Laboratory experiment at USDA-USFS Fire Lab

Analysis of fire laboratory data show possibility of routine satellite monitoring of fires and fire products is possible. Products include total mass loss and total carbon burnt. Roughly half the data has been completely reduced and partially analyzed.

6. Remote sensing of dust using IR techniques

The development of a new technique for remote sensing of dust over land using IR channels is progressing well. Retrieval of optical thickness is confirmed using ground-based sunphotometry for optical thickness less than 1.0 or greater than 1.0, but is less accurate when optical thickness is close to 1.0. Simulations have begun in order to test the observations against theory.

7. Surface Properties in the Mid-IR and visible channels

The aerosol land algorithm is based on the assumption that we will be able to determine surface reflectance in the visible channels from the reflectance at 2.1 μm. The method uses an empirical relationship between the two spectral regions. We continue to check the empirical relationship by collecting spectrometer data over Charles County, most recently when the vegetation was still in senescent state in March, and using the CAR instrument carried by the Univ. of Washington's C-131 aircraft to test angular characteristics. We will add to this data base by measuring surface properties in Israel during May. Preparations for the experiment are on-going.

8. Archiving of Images and Validation

MAS and AVIRIS images from SCAR-B and TARFOX are processed, resampled and archived to create a validation test bed. These data have been used for continual testing of all MODIS algorithms. A validation paper is in draft form.

9. Smoke look-up table completed

The aerosol over land algorithm is dependent on look-up tables created for each aerosol type. The smoke aerosol look-up table is now complete. The urban/industrial look-up table is in progress. Dust has not been started. Furthermore, the more involved look-up tables for the aerosol over ocean algorithm is in progress.

10. Atmospheric Discipline Group Joint QA Plan

The Atmospheric Discipline Group Joint QA plan includes general approach (run time and post run time) for quality assessment of the atmospheric products, and specifically the information content in the form of science data set and ECS core metadata for each atmospheric product. Delivered on March 20, 1997.

11. Vegetation Indices

A new vegetation index is being developed. It is designed to have similar sensitivity to the surface features as the NDVI, but be free of atmospheric effects (at least for smoke and urban/industrial aerosol). NDVI and ARVI are presently the indexes most sensitive to the vegetation absorption of the red part of the spectrum. In this Atmospherically FRee Index (AFRI) the 0.86 µm is replaced with 1.2 µm and the 0.66 µm with 1/2 of the value at 2.1 µm. After successful test for the effect of smoke and surface cover of the Cerrado in Cuiaba Brazil, we plan to apply the test to other regions. In the case tested the index correlates with the NDVI in clear conditions with correlation coefficient of 94%.

12. Urban/Industrial aerosol model

The paper detailing the urban/industrial aerosol model was submitted to JGR.

Problems, complaints

Too much time is spent on budget issues. We should ask for similar exemption from financial predictability as the rest of the MTPE research. Research spending as oppose to other expenses is less predictable and less monotonous.

Submitted papers:

A First Inference of Atmospheric Response to Dust Forcing from a Data Assimilation System, P. Alpert, Y. Shay-El, Y. J. Kaufman, D. Tanre, A. da Silva, S. Schubert, Y. H. Joseph, submitted to Nature April 97

"Model for Urban industrial aerosol", L.A. Remer and Y.J. Kaufman submitted to JGR

"Long term trends and seasonal variations of aerosol concentration at Barrow, Alaska", A.V. Polissar, P.K. Hopke, P. Paatero, Y.J. Kaufman, D.K. Hall, B. A. Bodhaine, and E.G. Dutton, submitted to JGR

In final stages of preparation:

"Monitoring Global Fires from EOS-MODIS", Y. J. Kaufman, C. Justice, L. Flynn, J. Kandall, E. Prins, D. E. Ward, P. Menzel and A. Setzer